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PARANCHISTUS PYCNODONTAE SP. NOV., A NEW PONTONIINE SHRIMP ASSOCIATED WITH AN OSTREID BIVALVE HOST

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ABSTRACT

Paranchistus pycnodontae (Crustacea, Decapoda, Pontoniinae), a new species of shrimp from Heron Island, Queensland, is described and illustrated. The species is most closely related to *P. spondylis* Suzuki, from which it is distinguished. It is the second species of this genus to be found in Australian waters and the first to be found in association with an ostreid host, *Pycnodonta hyotis* L.

The genus *Paranchistus* was first designated by Holthuis (1952), and at present includes four species, all of which are now known to be associates of large marine bivalve molluscs. Of these four species, only one, *Paranchistus armatus* (H. Milne-Edwards), has so far been recorded from Australian waters. This species is an associate of the giant clam, *Tridacna gigas* (L.), and has been reported from Undine Reef, Cape Tribulation, and from Chapman Island, Queensland (McNeill 1968, Bruce 1975). Recently a single example of another species of this genus was found in association with an ostreid bivalve, and the specimen is now described here as new species.

Paranchistus pycnodontae sp. nov.
(Figs. 1–5, Plate 39)

MATERIAL EXAMINED

HOLOTYPE: Queensland Museum W7337, ♀, non-ovigerous; Heron Island, Capricorn Group, Queensland; No. 2442, 3 m, central lagoon, 17 August 1976, coll. D. Fisk.

DESCRIPTION

A medium sized pontoniine of moderately slender build. Carapace smooth. Rostrum well developed, strongly compressed, with feebly developed carina and extending anteriorly to middle of intermediate segment of antennular peduncle; rostrum horizontal, dorsal and ventral margins straight and subparallel, tapering to an acute tip distally; distal third of upper border with five small subequal, acute teeth, with numerous setae in interspaces; ventral border sparsely setose with a single very small acute tooth below third dorsal tooth. Orbit feebly developed, supraorbital spines absent; inferior orbital angle slightly produced, broad in dorsal view. Antennal spine small, slender, marginal, not exceeding inferior orbital angle. Hepatic spine distinctly projecting, more slender than antennal spine and lower and more posterior, in a small fossa and mobile. Anterolateral angle of carapace bluntly rectangular.

Abdominal segments smooth. Third segment not produced posteriorly in dorsal midline. Length of sixth segment 0·13 × depth, 0·15 × length of fifth segment. Pleura 1–3 only slightly expanded, 4–5 smaller, bluntly rounded posteriorly, 6 with posteroventral angle blunt, posterolateral angle slightly more acute.

Telson *c.* 1·5 × length of sixth abdominal segment, 2·2 × longer than broad; lateral margins almost straight, converging posteriorly; anterior width *c.* 2·7 × width at level of lateral pair of posterior spines. Two pairs of small, subequal, submarginal dorsal spines at 0·6 and 0·7 of telson length. Posterior telson margin rounded, without median point, with three pairs of spines; lateral pair small, similar to dorsal spines, situated on dorsal surface of telson, slightly in advance of posterior margin; intermediate pair very stout, *c.* 0·14 × telson length, with attenuated distal ends, submedian pair uniformly tapering, setulose, *c.* 0·75 × intermediate spine length.

Eyes normal, cornea globular, hemispherical, slightly oblique, with distinct accessory spot; podophthalmite slightly flattened, *c.* 1·2 × longer than broad, distinctly wider than diameter of cornea.

Antennules normal; peduncle exceeds rostrum by most of intermediate segment; proximal segment *c.* 1·3 × longer than proximal width, medial border straight, without ventral spine; stylocerite slender, acute, exceeding half segment length; lateral border feebly convex, medially convergent, with very short subrectangular distolateral spine; anterolateral margin strongly produced, distinctly angulated; intermediate and distal segments subequal, obliquely articulated, *c.* 0·7 × length of proximal segment. Upper flagellum short, biramous, proximal three segments fused; shorter free ramus with two stout segments, longer with nine slender segments; four groups of aesthetascs. Lower flagellum slender, sixteen segments.

Antenna with robust basicerite, with feeble distolateral tooth; ischiocerite, merocerite normal; carpocerite slender, exceeding middle of scaphocerite, *c.* 3·2 × longer than wide. Scaphocerite well developed, extending well beyond antennular peduncle; lateral border very feebly convex, with acute distolateral spine, not exceeding anterior margin of lamina. Lamina broad, *c.* 2·2 × longer than width, anterior margin broad, slightly truncate. Flagellum short, slender, *c.* 2 × postorbital carapace length.

Mouthparts generally similar to other species of *Paranchistus*. Mandibles moderately robust, without palp; molar process stout, with several large blunt distal teeth, incisor process slender, three acute teeth distally, central tooth smallest.

Maxillula normal; palp with feebly developed lateral lobe, medial lobe normal with small hooked terminal seta; upper and lower lacinia broad, densely setose with strongly setulose seta; short, stout, feebly dentate spines distally on upper lacinia, spiniform setae on lower.

Maxilla with stout, proximally swollen palp, medial and lateral borders setose, distally slender, non-setose. Basal endite well developed, broad, deeply cleft, each lobe with numerous long, slender, setulose setae. Scaphognathite broad, *c.* 2·6 × longer than width; anterior lobe broad.

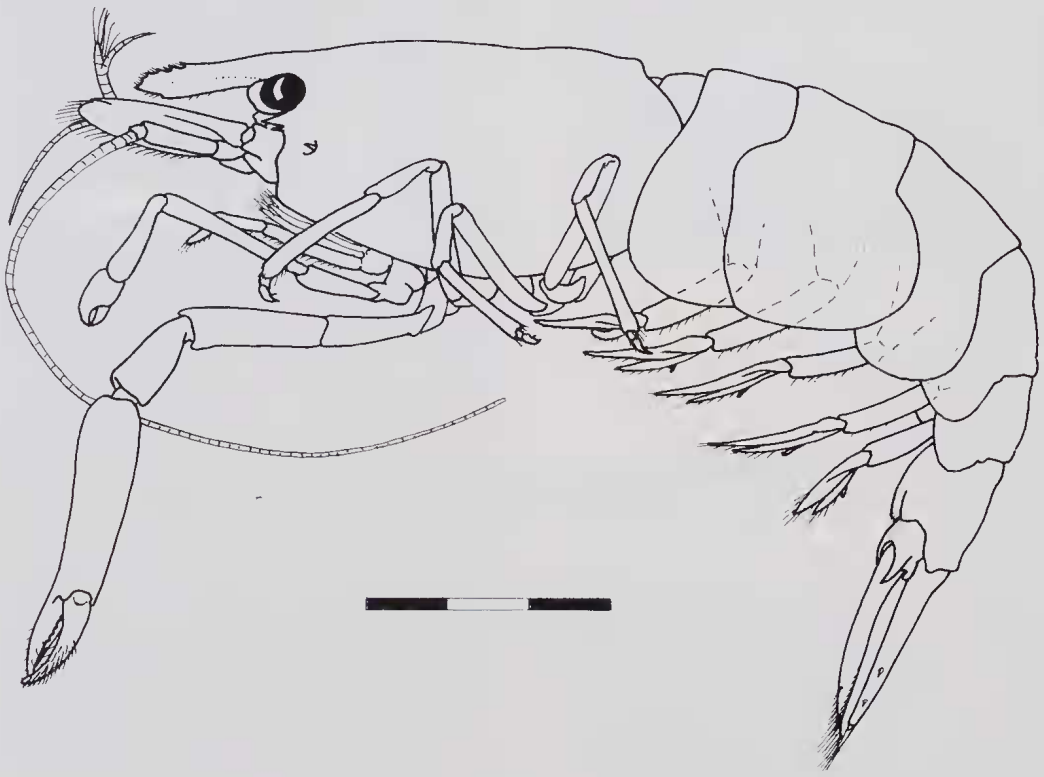

FIG. 1: *Paranchistus pycnodontae* sp. nov., holotype female, Heron Island, Queensland. Scale in mm.

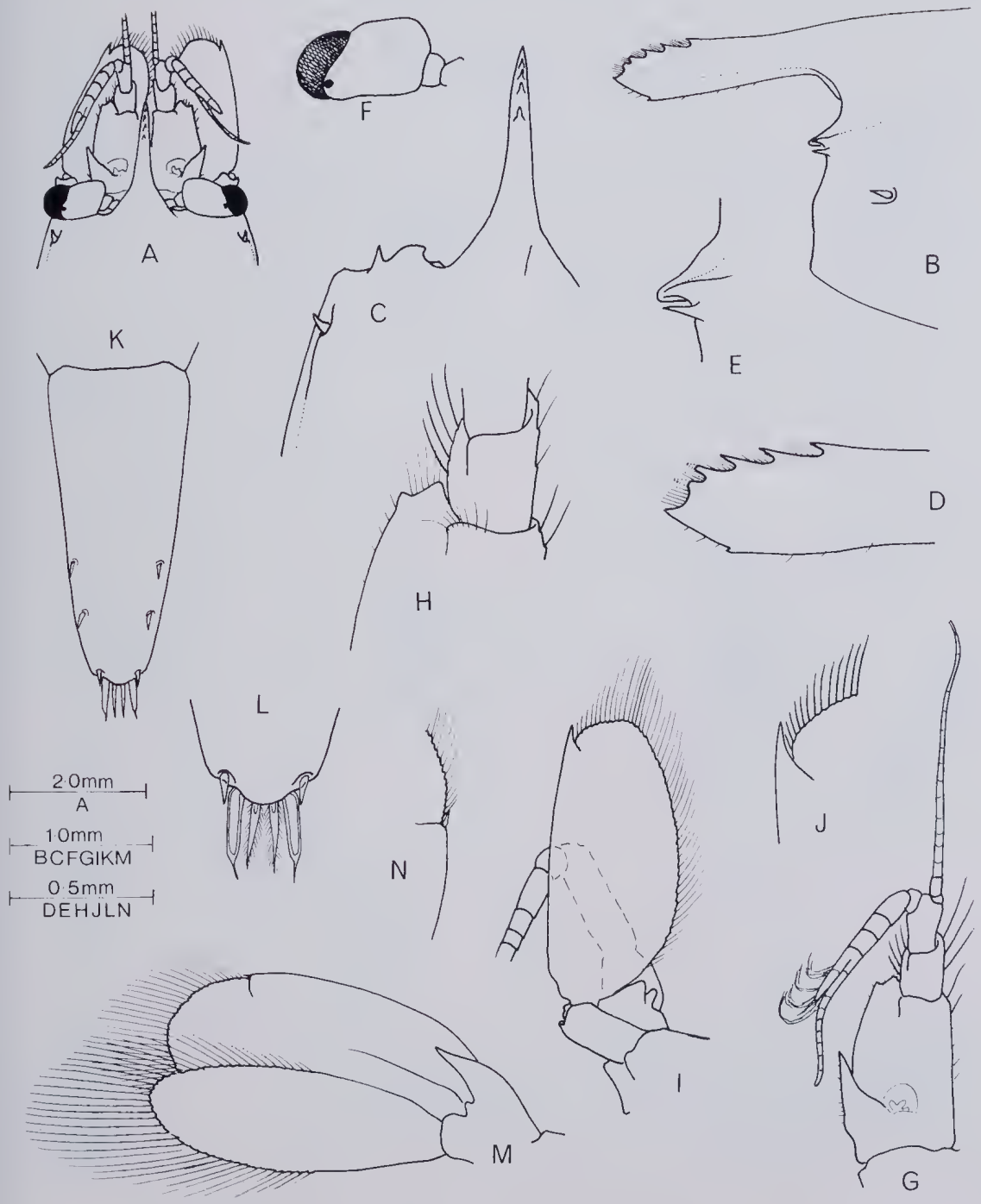

FIG. 2: *Paranchistus pycnodontae* sp. nov., holotype: A, anterior carapace, rostrum, and antennae, dorsal aspect; B, anterior carapace and rostrum, lateral; C, orbital region, dorsal; D, distal rostrum; E, inferior orbital angle and antennal spine; F, eye, dorsal; G, antennular peduncle; I, antenna; J, distolateral tooth of scaphocerite; K, telson; L, posterior telson spines; M, uropod; N, distolateral spine of exopod of uropod;

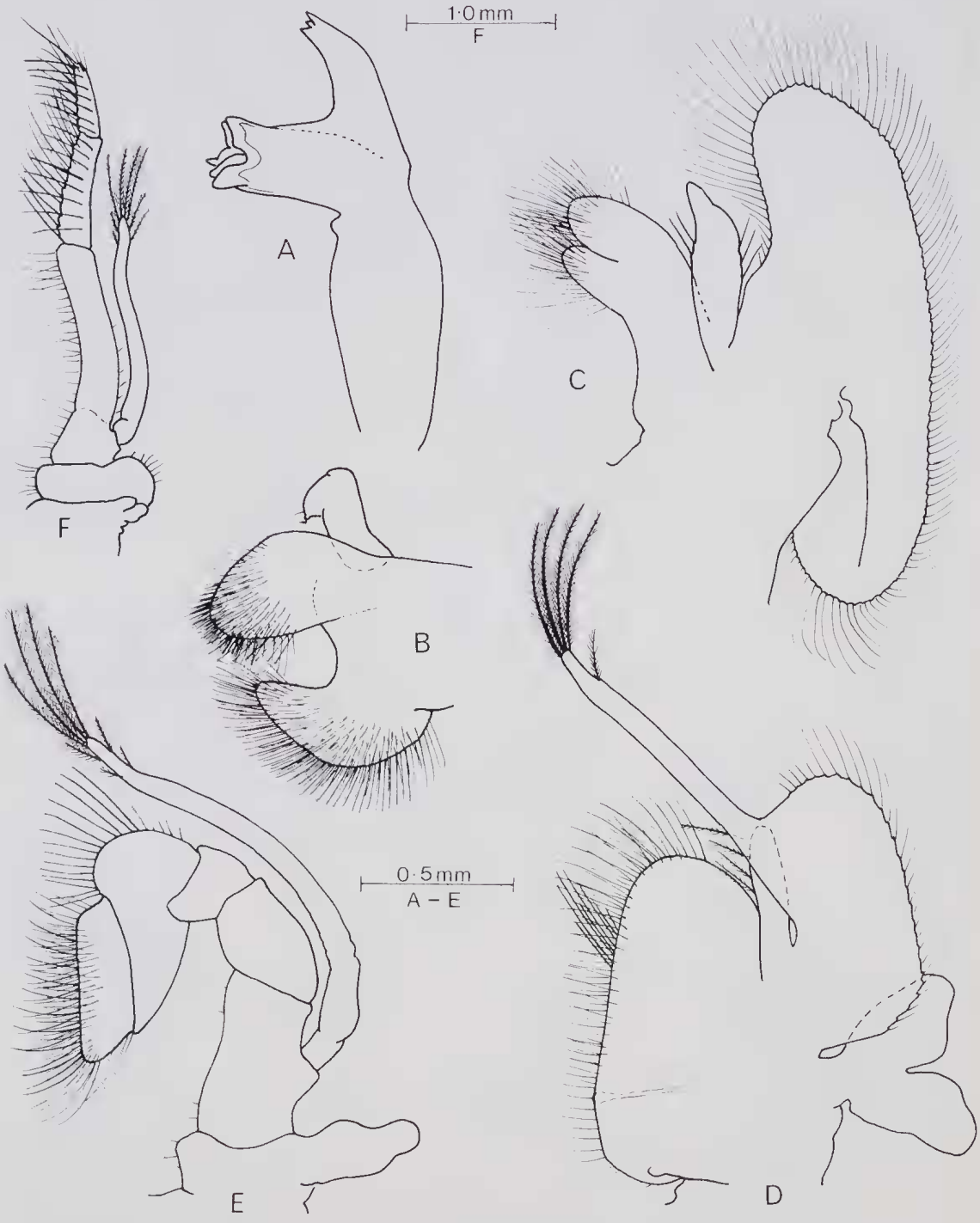

FIG. 3: *Paranchistus pycnodontae* sp. nov., holotype: A, mandible; B, maxillula; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped;

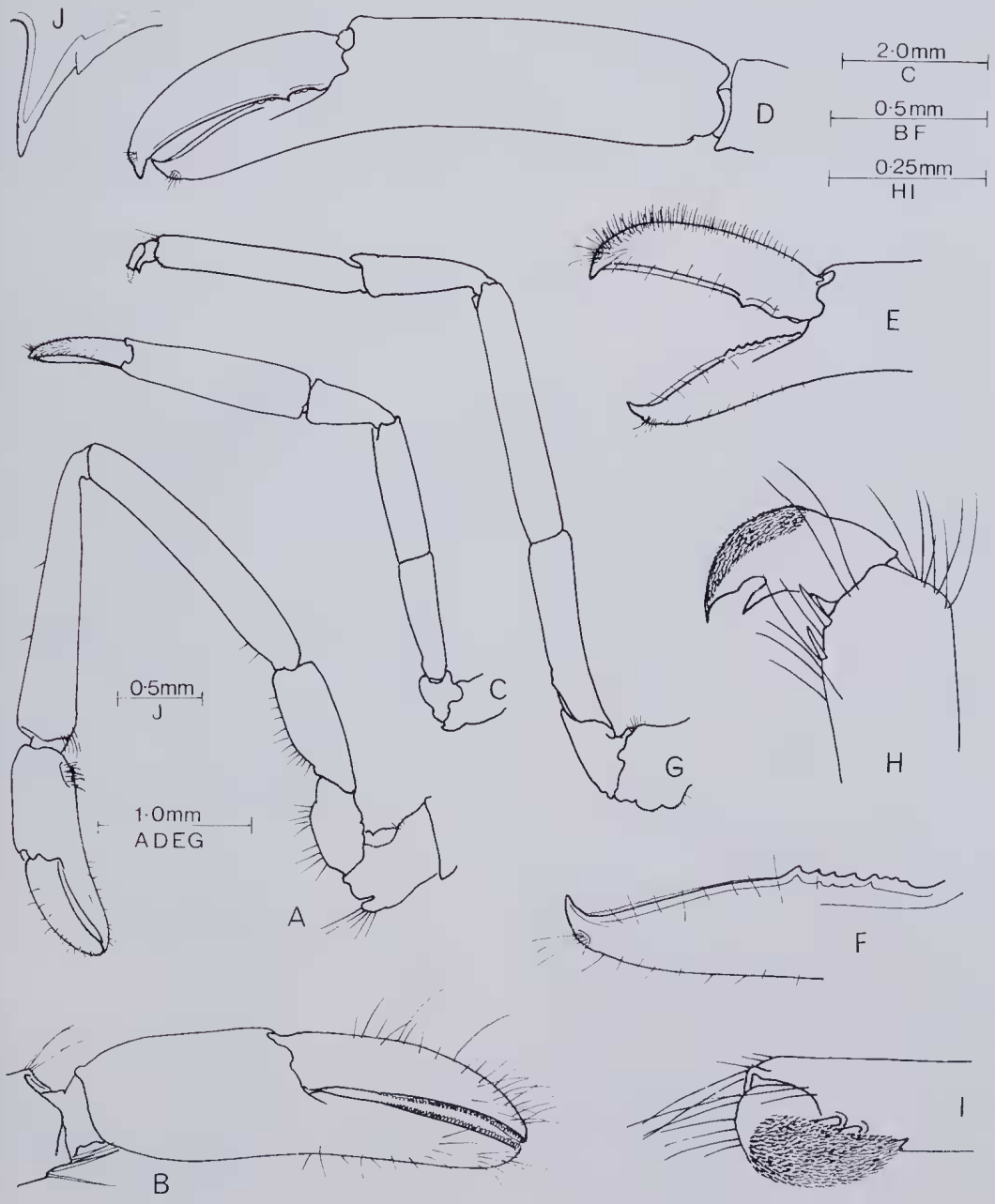

FIG. 4: *Paranchistus pycnodontae* sp. nov., holotype: A, first pereiopod; B, chela of first pereiopod; C, second perciopod; D, chela of second pereiopod; E, fingers of chela; F, fixed finger of chela; G, third pereiopod; H, distal propod and dactyl of third pereiopod, lateral; I, *idem*, dorsal aspect of dactylus; J, accessory dactylar tooth of fourth pereiopod;

First maxilliped with subcylindrical palp, distomedially with setulose setae, exceeding anterior margin of endite but not caridean lobe; basal endite broad, rounded, medial border straight, confluent with coxal endite, junction indicated by minute protuberance, with numerous slender finely setulose setae; dorsal surface with oblique row of long, coarsely setulose setae; coxal endite sparsely setose. Exopod well developed, flagellum with four plumose distal setae only, caridean lobe small, broad. Epipod triangular, deeply bilobed.

Second maxilliped normal; dactylar segment *c.* 3 × longer than broad, numerous slender, finely setulose setae medially. Exopod with four plumose setae distally; epipod small, irregularly subrectangular; podobranch absent.

Third maxilliped moderately slender, reaching proximal end of carpocerite; ischiomerus feebly separated from basis, junction indicated medially by small notch; ischiomerus slightly tapering distally, moderately bowed, *c.* 4 × longer than proximal width, medial border feebly setose, short simple setae; penultimate segment *c.* 0·6 × ischiomerus, 3·2 × longer than width, with longer stouter setae medially and laterally; distal segment similarly setose, *c.* 0·5 × ischiomerus, tapering, *c.* 3·5 × width, Basis broad, sparsely setose medially, as long as wide: coxa stout, medially rounded, well developed epipod laterally. Exopod slightly exceeds ischiomerus, four plumose distal setae. Arthrobranch rudimentary.

Coxae of third maxillipeds widely separated; fourth thoracic sternite broad, unarmed.

First pereiopods slender proximally, stouter distally, exceeding carpocerite by carpus and chela; chela robust, palm subcylindrical, slightly compressed; fingers subequal to palm, broadly subspatulate, distally rounded with fine denticulations along distal third of cutting edge medially and two thirds laterally, slightly gaping proximally on medial side, densely setose. Palm *c.* 1·7 × longer than width, transverse rows of cleaning setae proximally. Carpus proximally slender, width increasing × 3 distally, *c.* 5 × longer than distal width, cleaning setae distomedially; merus subequal to carpus, slightly bowed, *c.* 6·4 × longer than width; ischium compressed, *c.* 2·6 × width, *c.* 6·5 × merus, medial border with row of short setae; basis 0·33 × merus, sparsely setose along medial margin, coxa robust, small setose ventromedian process present.

Second pereiopods well developed, slender, subequal, similar. Palm of chela subcylindrical, smooth, slightly compressed distally, *c.* 3·4 × width; fingers well developed, *c.* 0·6 of palm length, dactylus strongly curved, overreaching fixed finger, tip acutely hooked, cutting edge sharp, entire except for small tooth at 0·3 of length, outer surface with numerous short, erect setae; fixed finger similar, proximal half of cutting edge with eight small teeth, distal four subacute, proximal four rounded, distal part of cutting edge feebly denticulate. Carpus *c.* 0·47 × palm length, 2 × longer than distal width; distal margins feebly excavate, unarmed. Merus *c.* 0·75 × palm length, 4 × longer than width, uniform, with small distoventral tooth. Basis and coxa normal.

Ambulatory pereiopods slender, third extending beyond scaphocerite by 0·3 of carpus and chela; dactyl about 0·27 × propod length; unguis distinct from corpus, dorsoventrally compressed, hastate, surface covered with dense felt of short processes giving furry appearance; corpus with single well developed, slender acute accessory spine; short distal sensory setae present. Propod *c.* 6·6 × longer than width, uniform, with pair of distoventral spines and single preterminal ventral spine. Carpus 0·63 propod length, *c.* 3·2 × longer than distal width, unarmed; merus *c.* 1·27 × propod length; ischium *c.* 1·0 × propod length, *c.* 5 × longer than distal width; basis and coxa robust, all unarmed. Pereiopods 4–5 similar: 3, 5 subequal, 4 slightly shorter. Accessory spines on dactyls of pereiopods 4, 5, with small additional denticle on posterior margin.

Uropods slightly exceed telson tip, protopodite with large acute posterolateral tooth; exopod broad, *c.* 2·3 × longer than wide, broadly rounded distally, with small mobile spine only at posterior end of convex lateral border; endopod *c.* 3 × longer than width.

MEASUREMENTS: (In millemetres)

Total length (approx.)	18.7
Rostrum and carapace	6.2
Postorbital carapace	4.5
Second pereiopod chelae	3.8 (left and right)

COLOURATION: Semi-transparent with numerous small round evenly distributed red chromatophores, all over body, ambulatory pereiopods, antennae and caudal fan. Similar but slightly larger chromatophores over second pereiopods. Chromatophores absent from antennal flagella and propods of ambulatory pereiopods.

HOST: *Pycnodonta hyotis* L. (Ostreidea)

ASSOCIATES: One specimen of *Onuxoden parvibrachium* (Fowler) (Pisces: Carapidae), a species not previously known from Australia.

TABLE 1: HOSTS OF SPECIES OF PARANCHISTUS AND OTHER PONTONIINE ASSOCIATES

Paranchistus spp.	*Hosts*	*Other associates*
P. armatus (H. Milne-Edwards)	*Tridacna gigas* (L.)	*Anchistus miersi* (De Man) *Conchodytes tridacnae* Peters
P. ornatus Holthuis	*Atrina vexillum* Born	*Anchistus custos* (Forskal) *Conchodytes biunguiculatus* (Paulson)
P. nobilii Holthuis	*Spondylus gaederopus* L.	—
P. spondylis Suzuki	*Spondylus barbatus* Reeve	—
P. pycnodontae sp.nov.	*Pycnodonta hyotis* L.	*Platypontonia hyotis* Hipeau-Jacquotte

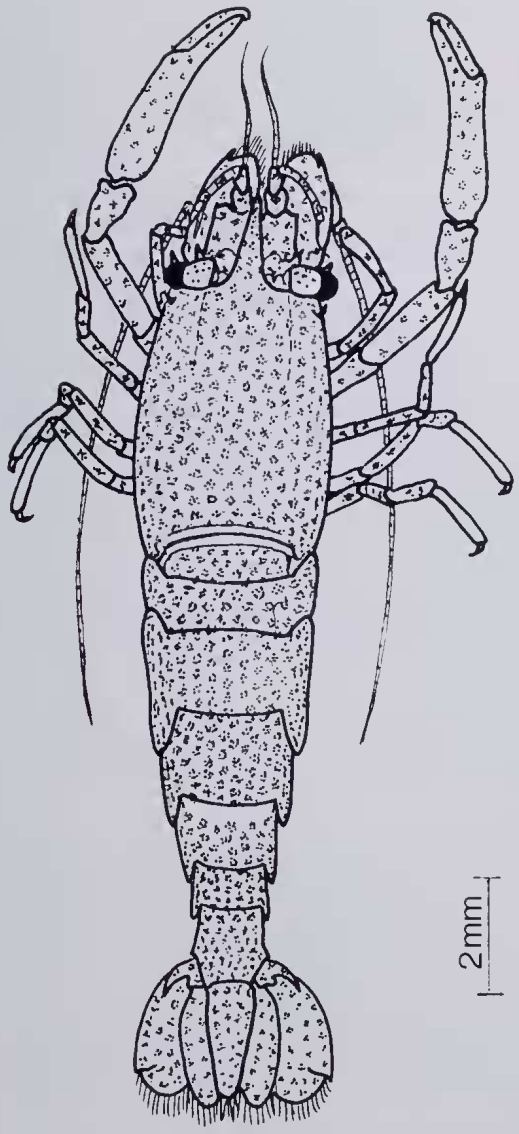

FIG. 5: *Paranchistus pycnodontae* sp. nov., holotype, colour pattern.

SYSTEMATIC POSITION OF *P. pycnodontae*

Paranchistus pycnodontae appears to be most closely related to *P. spondylis* Suzuki, and may be distinguished from that species by the sub-spatulate fingers of the first pereiopods. In all other features the morphology of the two species appears to be very similar. Other minor differences include: In *P. spondylis* (a) the palm of the chela of the second pereiopods appears to be stouter; (b) the accessory spines of the ambulatory pereiopods are shorter and stouter; (c) the accessory spines of the dactyls of the fourth and fifth pereiopods are without denticles; (d) the minute processes on the anterior aspect of the dactyls of the walking legs are perpendicular to the surface; (e) the lateral posterior telson spines appear to be marginal; (f) and the intermediate posterior telson spines are of uniform taper.

DISCUSSION

All species of the genus *Paranchistus* Holthuis are known to be associates of bivalve molluscs. The genus is not represented outside tropical Indo-West Pacific waters. The host molluscs belong to the families Tridacnidae, Pinnidae, Spondylidae and now also include the Ostreidae. *P. pycnodontae* is the only shrimp so far known to associate with *Pycnodonta hyotis* in Australian waters, but in the western Indian Ocean Hipeau-Jacquotte (1971) has recorded the occurrence of a different pontoniine shrimp, *Platypontonia hyotis* Hipeau-Jacquotte, which is also known to associate with *Pterostrea imbricata* (Lam.) in Japanese waters (Suzuki 1971). The only other ostreid bivalve known to have a pontoniine associate is *Lopha cristagalli* (L.), the host of *Platypontonia brevirostris* (Miers), (Bruce 1968).

The hosts of the species of *Paranchistus* are summarized in Table 1, which also indicates other pontoniine associates of the same host.

In addition to the morphologieal eharaeters that distinguish *P. pycnodontae* from *P. spondylis,* it may be noted that the colour patterns also appear to be distinetive. In the figures of the latter given by Suzuki (1971), the speeimen shows a eomparatively eoarse pattern of larger and more sparsely distributed red ehromatophores than is found in *P. pycnodontae.* Most of the pontoniine assoeiates of the bivalve molluses present a eolour pattern of uniformly distributed ehromatophores over most of the body surfaee and appendages. These may be very small and numerous, as in *Anchistus custos, Paranchistus ornatus* or *Conchodytes tridacnae.* In *P. spondylis* and *P. pycnodontae* they are larger and more numerous, and in *Anchistus demani* and *A. miersi,* they are eonspieuously larger and mueh less numerous. In complete eontrast, the eolour pattern of *Platypontonia hyotis* eonsists mainly of large spots and bands of red.

The daetyls of the ambulatory pereiopods are of partieular interest as, in the genus *Paranchistus,* they exhibit a wide range of morphologieal variations of great value in distinguishing the species. *P. armatus* presents a simple condition, with a simple, well developed unguis distally and a broad aeeessory tooth. There is no traee of ornamentation on the unguis (Bruee 1975). In *P. ornatus* the unguis is still distinet from the eorpus and the outer surfaee is eovered with transverse rows of short spines whieh beeome obsoleseent towards the tip. The ventral aspeet of the unguis is also transversely ridged. The eorpus has distal sensory setae present, but the aeeessory spine is absent, the region of the spine being provided with a low eminence eovered with small tubereles. The pit described by Holthuis (1952) appears to be a vesiele below this eminenee. In *P. pycnodontae,* the arrangement is essentially similar exeept that a well developed aeeessory spine is present and the unguis is very mueh larger. A comparable vesieular strueture and sensory setae are also present. *P. nobilii* and *P. spondylis* have daetyls very similar to *P. pycnodontae.*

Fujino (1975) has provided seanning electron photomierographs of the daetyl of the walking legs in *Anchistus miersi* (De Man). *Anchistus* Borradaile is a genus very closely related to *Paranchistus* Holthuis, from which it is separated prineipally by the eomplete absenee of an hepatie spine. In *Anchistus* a eomparable range of variation in daetylar morphology is also present and in speeies sueh as *A. demani* Kemp and *A. miersi,* with *A. gravieri* Kemp representing a less well developed stage, and the daetyls very closely resemble those found in some *Paranchistus* spp. SEM photomierographs elearly show that the outer surfaee of the unguis of the daetyls is densely eovered with large numbers of short erect spinules. In *Anchistus* the anterior aspeet of the unguis has been reported as seoop-shaped (Kemp 1922; Fujino 1975) but in *Paranchistus* spp. this surfaee appears to be convex rather than eoneave. The preeise funetion of the spinulations of the unguis is still obseure, but is presumably related to the grip of the shrimp upon its host. The funetion of the ventrally situated tooth on the eorpus would appear to enable a good grip upon the host's tissues to be obtained during traetion by the limb. The distally direeted spinules of the unguis may function by preventing the penetration of the daetyl too far into the host's tissues and thereby avoiding exeessive damage to the host in a commensal relationship.

ACKNOWLEDGMENT

I am grateful to Dr Paxton for the identifieation of the assoeiated fish.

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PLATE 39
Paranchistus pycnodontae sp. nov., holotype, in *Pycnodonta hyotis* L.